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THESIS

TECHNOLOGY TRANSFER AGENTS' PERCEPTIONS
OF THE TECHNOLOGY TRANSFER PROCESS

by

Bernadine Antoinette Lennon

December 1982

Thesis Advisor: J. W. Creighton

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The perceptions of technology transfer agents and individuals who staff the Office of Research and Technology Applications (ORTA) at Federal laboratories and agencies are investigated in this thesis. Specific areas which are studied are (1) a description of the technology transfer office, (2) the form of initial contact between technology transfer agents and users, (3) the technology transfer

process employed, (4) technology transfer agent and ORTA demographics and (5) areas where the technology transfer process effectiveness can be increased.

The conclusion identifies areas which the technology transfer agents and ORTA's perceive as needing improvement in the technology transfer process both within the laboratory and from the parent agency and also from the Federal government. The perceptions of the ORTA's in the implementation of the Stevenson-Wydler Technology Innovation Act are also discussed. Recommendations are proposed which address the technology transfer agents' and ORTAs' areas of concern.

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Technology Transfer Agents' Perceptions of the Technology Transfer Process

by

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ABSTRACT

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I. INTRODUCTION

A. BACKGROUND

Total outlays of Federal funds for research, development and R&D plant for FY80 were $31,811.7 million and it was estimated that in FY82 that figure would increase to $39,762.3 million--an increase of 12.7% [Ref. 1: p. 141]. These funds are distributed to over four hundred Federal laboratories and centers throughout the nation [Ref. 2: p. 108]. Some of these laboratories and agencies are members of the Federal Laboratory Consortium (FLC) for Technology Transfer--an organization of Federal R&D laboratories and centers representing the major departments of government in addition to the National Aeronautics and Space Administration, the Tennessee Valley Authority and the Environmental Protection Agency. The purpose of the Consortium is to coordinate interactions with other Federal agencies and technology users at the Federal, state and local level, with the focus on the transfer and adaptation of technology through person-to-person contact [Ref. 2: p. 110]. The FLC currently is composed of 230 members, of which 115 are Federal Laboratory representatives.

The coordination of technology transfer at the Federal laboratories and agencies (whether or not they are members of the FLC) is accomplished through a technology transfer

coordinator or agent. This is a generic term referring to an individual at a laboratory who is the point of contact for technology transfer information. In addition to maintaining contact with FLC and non-FLC members, technology transfer agents are also exposed to new technologies developed by state and local governments and private organizations. Thus, the agent can often bring together a user who has a problem with those who have already solved the problem or who are working on it.

The position of technology transfer agent was more formally and legally defined when Congress passed the Stevenson-Wydler Technology Innovation Act of 1980 (P.L. 96-480) (Appendix A contains the law in total). The Act was passed in order "to promote United States technological innovation for the achievement of national economic, environmental and social goals, and for other purposes" [Ref. 3: p. 2311].

Section 11 of the Act addresses the utilization of Federal technology by stating that the "Federal Government shall strive where appropriate to transfer federally owned or originated technology to state and local governments and to the private sector" [Ref. 3: p. 2318]. The law requires an Office of Research and Technology Applications (ORTA) with at least one professional individual full-time as staff for each Federal laboratory having a total annual budget exceeding $20 million; and after 30 September 1981, each Federal agency which operated or directed one or more

Federal laboratories was to make available not less than 0.5% of the agency's research and development budget to support the technology transfer function at the agency and its laboratories, including support of the Office of Research and Technology Applications. (The Act defines "Federal laboratory" as any laboratory, any federally funded research and development center, or any center established specifically by the Act (see Sections 6 and 8 of the Act) that is owned and funded by the Federal Government, whether operated by the Government or by a contractor.)

There was not unanimous support for this particular portion of the legislation by the Federal agencies. The National Science Foundation, commenting on the Act prior to its passage, stated,

> We appreciate the impulse behind these requirements and the wish to emphasize the importance of technology transfer efforts. But in our view the requirements themselves would be unwise and administratively unsound. In general, legislative prescription of administrative structures and staffing patterns at this level of detail seems to us inappropriate and intrusive on functions of the executive branch and its managers. Applied to laboratories and centers, many of which have been deliberately placed under independent operation, it seems especially so. [Ref. 4: pp. 60-61]

The Department of Commerce responded to the proposal by stating:

> As other federal agencies have stated in letters to you [Ref. Don Fuqua, Chairman, House Committee on Science and Technology], the Administration believes the policy of set asides [funds] as stipulated in subsection 11(b) is neither administratively sound nor appropriate. Not all federal laboratories have research programs which generate significant quantities of information which could be usefully

> transferred. It would be wasteful to require these laboratories to establish technology transfer offices....The specified minimum staffing requirement and budgetary set aside are also objectionable...the set aside dictates a multi-million dollar program in a whole range of agencies at the expense of other existing and important programs. [Ref. 4: pp. 51-52]

Despite these concerns from the Federal agencies, the Stevenson-Wydler Act passed, with the Department of Commerce and the National Science Foundation being charged with administering the programs. Virtually all funds under the Act for the Commerce Department were eliminated by the Reagan budget makers. The Carter Administration's 1982 budget had called for a variety of innovation programs but only about $17 million survived in the Reagan revision ($1 million of which is for studies on innovation and technology transfer). Commerce Deputy Secretary Wright argued the Administration's viewpoint by stating that technological innovations and the improvement of productivity are the responsibility of the private sector and will prosper when the economic climate is favorable [Ref. 5: p. 627].

B. OBJECTIVES

The objective of this thesis is to gather information on the Office of Research and Technology Applications (hereafter referred to as ORTA) at the Federal laboratories subject to Section 11(b) of the Stevenson-Wydler Act and on the technology transfer agents at other Federal laboratories. There is a need to assess these positions currently, in light of

budgetary changes and the passage of the Stevenson-Wydler Act.

In preparation for this assessment, telephone interviews were conducted between December, 1981 and February, 1982 to gain background information from those ORTA's and technology transfer agents in the field on their perceptions of the Stevenson-Wydler Act. Additionally, the author attended a meeting of the Federal Laboratory Consortium (Far West Regional Meeting) in February, 1982 at the Lawrence Livermore National Laboratory to gather first-hand information on technology transfer issues from key individuals in the field. The background information that had been gathered was used to develop a questionnaire which was reviewed for accuracy, understandability and relevance by a group of individuals experienced in technology transfer efforts. Any questions which were determined unsuitable were removed.

The revised questionnaire (see Appendix B) was mailed to the technology transfer agents and ORTA's of 123 Federal laboratories and agencies throughout the United States during July, 1982 (23 of these were non-FLC members). Sixty questionnaires were returned, representing a response rate of 49%.

A literature search was also conducted which resulted in numerous articles on the technology transfer process and corresponding legislation. Information was found on previous data gathering efforts conducted on technology transfer

agents and the users of technology. Chapter II discusses the results of the questionnaire and Chapter III provides a summary of conclusions and recommendations for further study.

II. SURVEY DESIGN AND RESULTS

A. SURVEY DESIGN

The Technology Transfer Questionnaire was patterned after a questionnaire developed by the Ohio Technology Transfer Organization (OTTO) and administered in 1981 to users of technology transfer [Ref. 6]. Although not every item of that questionnaire was repeated in the present questionnaire, it was felt that it would be useful to compare the perceptions of users of technology transfer with those of technology transfer agents on similar questions appearing in both surveys. A comparison between the responses of the two surveys is made for questions 5, 7 and 8. Additional questions were asked of technology transfer agents and ORTA's as a result of telephone interviews and literature readings. The questionnaire encompassed questions dealing with (1) the technology transfer office description, (2) the form of initial contact between the technology transfer agent and the user, (3) the technology transfer process, (4) the technology transfer agent demographics, and (5) areas to increase technology transfer effectiveness.

Tables 1 through 20 represent the responses for each question by the respondents. Question 21 required the respondent to write an answer(s) and these are compiled in

Appendix C. A brief summary of these responses is indicated within this chapter.

The questionnaire was designed to be answered by the technology transfer agent or ORTA at the Federal laboratory or agency. Because the respondents were asked to remain anonymous, there is no guarantee that all the responses are those of the targeted group. The following chart is a breakdown of where the surveys were sent and rate of return:

Geographic Area	Number Sent	Number Returned	Rate of Return
Northeast Region (MA, NJ, NH, NY, CT, RI)	20	11	55%
MidAtlantic Region (VA, MD, WVA, WASH DC, PA)	31	17	55%
Southeast Region (FLA, MS, ALA, TN, NC)	16	7	44%
Midwest Region (OH, IL, MI, WI, IN, MN, IA)	17	5	29%
Midcontinent Region (TX, NM, WY, UT, CO, OK)	16	7	44%
Far West Region (CA, ID, WASH)	23	12	52%
Unknown		1	
TOTAL	123	60	49%

Government Department/Agency	Number Sent	Number Returned	Rate of Return
Dept. of Transportation	4	3	75%
Dept. of Defense	48	28	58%
Dept. of Justice	1	0	0
Dept. of Interior	4	1	25%
Dept. of Health/Human Services	10	1	10%
Dept. of Agriculture	6	5	83%
Dept. of Energy	32	13	41%
Dept. of Commerce	2	0	0
Other Agencies			
NASA	10	4	40%
EPA	3	3	100%
TVA	1	0	0
Unknown		2	
TOTAL	123	60	49%

Note: Laboratories at the following subdivisions of the governmental agencies and departments listed above were sent surveys: Federal Highway Administration, Federal Aviation Administration, USCG, USN, USAF, USA, Fish/Wildlife Service, Geological Survey, FDA, Forest Service, National Telecommunication and Information Administration, and National Bureau of Standards.

B. SURVEY RESULTS

Questions 1 and 2:

Eleven of the sixty respondents indicated that the office through which technical information or assistance is available was the Office of Research and Technology Applications (ORTA). Twenty-five responses used the words "technology" or "technical" in the title with "technology transfer" and "technology utilization" being the most common terms. The remaining 24 responses varied in description (i.e.

TABLE 1

Question 1: What is the name of the office at your laboratory through which technical information or assistance is available?

Response:

11 (18%) Office of Research and Technology Applications (ORTA)

25 (42%) Technology Transfer, Technology Utilization (or technology in name)

24 (40%) Other. (e.g. R&D, Public Affairs, Planning and Developing, Programming)

TABLE 2

Question 2: What is the organizational title of the individual who heads the office described above?

Response:

17 (28%) Director/Assistant Director

18 (32%) Manager/Head/Chief

11 (18%) Technology Coordinator/Technology Officer

13 (22%) Other.

Questions 3 and 4:

42% of those questioned responded that their job as a technology transfer agent was a full-time position with the remaining 58% of the respondents indicating that their position was part-time. The average number of full-time assistants was 5 while the average number of part-time assistants was 4 (Tables 3 and 4).

TABLE 3

Question 3: Is your position as Technology Transfer Agent a full-time or a part-time job?

Response:

25 (42%) Full-time

35 (58%) Part-time

TABLE 4

Question 4: How many assistants does the Technology Transfer Agent have?

Response:

FULL-TIME	NUMBER	PART-TIME	NUMBER
Mean:	5.2	Mean:	4
Range:		Range:	
High	60	High	9
Low	1	Low	1
Mode:	1,3,4	Mode:	1

Question 5:

The three most common methods by which users learned about technology transfer activities at the laboratory (as perceived by the technology transfer agents) were through personal contact by technical (R&D) staff, through personal contacts made by a technology transfer staff member and by attending conferences, workshops and seminars. The method utilized least of all was radio or television stories (Table 5). This is a common perception from the user's point of view also as indicated in the OTTO Survey where ten of

twenty-four respondents noted that they or someone in their organization first learned about technology transfer activities by personal contact being made with a technology transfer staff member. Several respondents to the technology transfer questionnaire chose to write in additional methods which the reader can refer to in Table 5.

TABLE 5

Question 5: What is the most common method by which users learn about Technology Transfer activities at your laboratory?

Response:

25	Personal contact by technical (R&D) staff
4	Through newspaper articles
1	Through radio or television stories
19	Personal contacts made by a Technology Transfer Staff member
8	By word of mouth between users
10	Through association contacts or newsletters (i.e. trade associations, Chamber of Commerce, etc.)
18	Attending conferences, workshops, seminars
21	Other:
	(1)* all of the above
	(13) through publication of newsletters/technical and research reports
	(3) Technical Brief Journal
	(1) organizational annual meeting
	(3) FLC for Technology Transfer

*Numbers in parentheses indicate number of respondents.

Question 6:

The majority of technology transfer agents indicated that potential users who requested their assistance had to some extent a specific request which was adequately defined (Table 6).

TABLE 6

Question 6: To what extent do potential users who request your assistance have a specific request which is adequately defined?

Response:

10 (18%) little extent
31 (54%) some extent
16 (28%) great extent

Question 7:

This question asked the respondents to rank the top three methods of technology transfer interaction with users. The three interactions chosen most frequently were: (1) giving one-on-one technical assistance, (2) informing users about special laboratory reports on studies which relate to the user organization's needs and (3) technological transfer concepts, equipment, etc. being presented at a conference, seminar or workshop attended by users (Table 7). The OTTO survey of technology users indicated that the top 3 interactions were (1) attending a conference, seminar or workshop in which technology transfer concepts, equipment, etc. were presented, (2) being informed about special laboratory reports on studies which related to their organization's needs and (3) being included in a mailing to receive specialized reports, newsletters, etc. (See Table 7A for similarities between OTTO survey responses and technology transfer agents' responses.) The four responses of the technology transfer agents' survey also appeared in the top four choices of the users' survey.

TABLE 7

Question 7: In which methods of Technology Transfer interaction are you most commonly involved with users? (Please rank 3 of the following with "1" being the most common, "2" being the second most and "3" being the third most common interaction.)*

Response:

NUMBER OF RESPONDENTS	AVERAGE OF RANKING FOR RESPONSE	RESPONSE
7	2.14	the technology transfer office assists the users in developing and presenting a proposal for funding support
9	1.88	the technology transfer officer conducts a special study for user's organization
22	2.04	the technology transfer officer aids the user's organization in retrieving information stored in such data banks as EIES, NTIS, DIALOG, etc.
32	1.96	technology transfer concepts, equipment, etc. are presented at a conference, seminar or workshop attended by users
44	1.65	giving one-on-one technical assistance
34	1.91	informing users about special laboratory reports on studies which relate to the user
22	2.18	having a mailing list to send users (specialized reports, newsletters)
6	2.33	inviting users to participate in the implementation of a packaged program technology, a computer system, etc.

*Although respondents were asked to choose and rank only 3 methods, some respondents ranked all the choices on a scale from 1 to 3. The closer the response average is to 1.0, the more common is the corresponding type of interaction between agent and user.

Furthermore, respondents indicated additional methods in the "other" response for this question. These responses can generally be grouped as providing user with publications, reports, information and arranging meetings and seminars with user(s) to discuss laboratory's resources. The complete listing of responses to the "other" category is as follows:

Question 7 (other):

- conducting jointly sponsored projects
- mailing copies of technical reports on projects directly to requester
- direct contact with users of specific information or products
- general distribution of reports reviewing information and products distributed in past fiscal year
- seminars, meetings discussing products with more than one user
- conducting guided industry searches of laboratory for relevant technology
- referral to another more appropriate source
- telephone, letter, training
- distribution of technology transfer publications
- personal contacts by R&D laboratory's scientists/ engineers
- meeting arranged to bring user in contact with laboratory's technical resources.

The similarity between the OTTO Survey responses and the technology transfer agents' responses for this question is summarized in the following table.

TABLE 7A*

OTTO Survey	Technology Transfer Agents' Questionnaire	Response
6	6	the technology transfer office assists the users in developing and presenting a proposal for funding support
5	5	the technology transfer office conducts a special study for the user's organization
4	4	the technology transfer office aids the user's organization in retrieving information stored in such data banks as EIES, NTIS, DIALOG, etc.
1	3	technology transfer concepts, equipment, etc. are presented at a conference, seminar or workshop by users
4	1	giving one-on-one technical assistance
2	2	informing users about special laboratory reports on studies which relate to the users organization's needs
3	4	having a mailing list to send to users (specialized reports, newsletters, etc.)
4	7	inviting users to participate in the implementation of a packaged program technology, a computer system, etc.

*The interpretation of this ranking indicates that "1" is the most common method used for interacting, "2" is the second most common, etc. The ranking is based on the number of respondents per response in Question 7.

Question 8:

To determine the medium of interacting with users, the technology transfer agents were asked for the most common

method of interaction. This turned out to be the telephone, which was also the response chosen most often by users in the OTTO Survey (Table 8).

TABLE 8

Question 8: During the life of a technology transfer project,* what is the most common method of interacting with the user? (Please indicate only one.)

Response:

Technology Transfer Survey	OTTO Survey	Response
15 (22%)	17 (28%)	face-to-face discussions
26 (37%)	18 (29%)	over the telephone
10 (14%)	12 (19%)	by mail
	2 (3%)	computer conferencing
17 (24%)	13 (21%)	a combination of the above methods
2 (3%)		other: (1) by involving user in technology transfer planning (1) combination time/user definition

*For the purposes of this questionnaire, a technology transfer project is any information or assistance provided as a result of interaction between the user and laboratory.

Questions 9 and 10:

To determine the amount of time that technology transfer agents spend with users, they were asked the percentage of time in the day that was spent interacting with users, and how that time was divided in different types of interactions. The average time spent by technology transfer agents with

users was approximately 17% with the majority of the time spent on the telephone and answering correspondence (Tables 9 and 10).

TABLE 9

Question 9: What percent of your work day is spent interacting with users?

Response:

Mean:	17.8%	Range: High	90%
		Low	1%

TABLE 10

Question 10: Of the time spent interacting with users, please indicate the percent of time you spend daily in the following interactions?

Response:

23%	face-to-face discussions
45%	over the telephone
29%	correspondence (mail)
11%	computer conferencing
10%	other: (1) workshops, planning (1) networking

Questions 11 and 12:

Respondents were asked to specify the number of projects and lengths of time it took to complete them both over the past twelve months as well as current projects and their lengths of time. It appears from the data that most projects in the past have been of short duration--two weeks or less--

and that the majority of current projects have been in existence less than one month (Tables 11 and 12).

TABLE 11

Question 11: Over the past twelve months, please indicate the number of completed projects and lengths of time required for completion by the technology transfer office.

Response:

Number of Projects Completed	Length of Time to Complete
3078	about 2 weeks or less
85	between 3 and 4 weeks
68	about 2-3 months
20	about 4-5 months
92	about 6 months

TABLE 12

Question 12: Please indicate the number of projects and lengths of time your office is currently working with users.

Response:

Number of Projects	Length of Time
245	less than 1 month
51	1-3 months
42	3-6 months
43	6-12 months
47	12-24 months
66	over 24 months

Question 13:

Responses to question 13 indicate that the factor under which technology transfer agents feel most contrained is

money for the technology transfer office, followed by time. These same concerns appear in Question 21 also and will be discussed at that time. Respondents indicated a number of other factors which are summarized in Table 13. A number of respondents chose to expand upon answering this question by writing comments concerning other constraining factors. Many of these constraints can be grouped into several categories: (1) lack of laboratory and government guidance on technology transfer, (2) lack of time and funds, (3) ineffective interactions and communications with users (see Table 13 (other) for complete listing).

TABLE 13

Question 13: When working with a user, please indicate the factor under which you feel most constrained.

Response:

15	time
24	money for technology transfer office
10	insufficient number of personnel on technology transfer staff
10	unclear definition of potential user's problem
12	other - biggest problem is informing a wide range of people on the possibilities of transferring technologies from the laboratory - travel funds and restrictions - OMB moratorium on publications, films, etc. - no established laboratory policy for transferring technology as yet, policy under development - principle constraint--unclear guidance and policies from primary sponsor (DOE) and laboratory administrators - proper federal role - selling user on being the first kid on the block to use this new toy; they all want to be "second". Let someone else work out the bugs, why change--we're making money now.

Responses to Question 13 (other) continued:

- lack of feedback
- a firm and continuous source of funds would reduce constraints in all areas
- limiting factor is time to extract follow-up and present items to potential users. Despite general distribution letters, etc. engineers are not thinking primarily of technology transfer so these items have to be dug out of project and activity reports in order to appear as technology transfer candidates
- sensitive nature of work being done at laboratory
- providing the service is still not institutionalized in the agency so that resources to address the problems of the user or even the exact extent of the appropriate user community have not been defined

Question 14:

There were very few identical answers to Question 14 which asked the respondent what prior experience was most helpful in their present job. An attempt was made to group responses into broad categories to see if there was a tendency for technology transfer agents to have a common background which was useful in their present position. Scientific, engineering and previous technology interest was a common theme along with experience in management and experience gained from interaction with people. However, since there was such a vast divergence of answers, it may be that the individual who is the technology transfer agent and what he or she brings to the job is of value rather than a particular job experience. Several respondents said it was their experience in life and their knowledge of a little about many things which was most helpful.

TABLE 14

Question 14: What experience gained prior to your present job has been most helpful in your present job?

Response:

14	science/technical/engineering/research and development
8	technical staff experience or familiarity with technical people/previous technology interest
7	interactions with various people
6	management/staff experience
5	information retrieval and dissemination
3	knowledge of lab's activities and other labs' activities
2	experience as a user or previous experience working with users of technologies
4	other: (1) systems analysis skills (1) operations research (1) business degree (1) no specific experience, generalist

Question 15:

To determine the length of time personnel have been in their present positions as technology transfer agents, respondents were asked to indicate the number of months in their position. The results reveal a fairly senior group with 65% of those responding indicating that they have been in their position more than 24 months. A complete breakdown is shown in Table 15.

TABLE 15

Question 15: How long have you been in your present position?

Response:

6	6 months or less
5	6-12 months
5	12-18 months
5	18-24 months
39	more than 24 months

Questions 16 and 17:

Questions 16 and 17 asked the respondent if he or she received specialized training or a turnover from the previous agent and whether they would have benefited from such training. Over half of the respondents indicated they received no training, turnover or guidelines for their jobs and 68% of the respondents said they would have benefited from such training (Tables 16 and 17).

TABLE 16

Question 16: When you began your present job, were you given any of the following for your job?

Response:

1	specialized training
11	guidelines or standard operating procedures
15	a turnover from the previous technology transfer agent
32	none of the above
4	other:
	(1) was not trained for the job. Have been responsible to train myself or seek training for myself on the job. Learned from senior member of FLC and associates
	(1) developed technology transfer process by working with consultant
	(1) experience has been out teacher
	(1) learned on the job--wasn't difficult--just kept reading and selling to staff.

TABLE 17

Question 17: Do you feel that you needed or would have benefited from such training?

Response:

Yes: 39		
No: 18		
written responses:	(1)	training in this position is a must
	(1)	if there had been any available in the beginning

Questions 18 and 19:

Respondents were asked if they perceived an adequate communication network between technology transfer agents in keeping up to date with current information. In conjunction with that, they were asked for the methods which kept them informed. 67% felt there was an adequate communication network between technology transfer agents. The most common method used for obtaining the latest information was by reviewing the Federal Laboratory Consortium Bulletins and Newsletters, followed by discussions with other technology transfer agents (Tables 18 and 19).

TABLE 18

Question 18: Do you feel that there is an adequate communications network between technology transfer agents in order to keep up-to-date with current information?

Response:

Yes:	38	(67%)
No:	19	(33%)

TABLE 19

Question 19: Please indicate the methods most used by you to keep informed in the technology transfer field of latest developments.

Response:

28	conferences/workshops
40	Federal Laboratory Consortium Bulletins/Newsletters
19	open literature
33	discussions with other technology transfer agents
4	other:
	(1) we identify projects based on R&D outputs from laboratories
	(1) laboratory visits as well as conferences and workshops
	(1) work within my laboratory
	(1) Technology Transfer Society

Question 20:

Thirty-six of sixty respondents indicated that less than 30% of their projects were transferable to state or local governments or private industry. Table 20 gives a further breakdown of the transfer.

TABLE 20

Question 20: What percentage of your projects are transferable to state or local governments or private industry?

Response:

36	less than 30%
7	30% to 60%
14	over 60%

Question 21:

The final question elicited a great deal of response from the agents. They were asked to list three factors or items which would assist them in making their job as a technology transfer agent more effective. There were 142 factors or items listed, some of which were repeated several times. An attempt was made to group similar items into categories for easier analysis. These are listed in Appendix C. By far, most technology transfer agents were concerned about lack of support and recognition for their jobs from within their laboratory's management and R&D personnel as well as from outside their laboratory (i.e. from their sponsoring federal agency). This feeling of lack of support for the technology transfer process was reflected also in the agents' responses

that they needed more funding and staff for their offices. Another area which drew many comments was on needing a better network (perhaps more formal network) between technology transfer agents in order to keep up-to-date on the latest information and also to better connect the user with the proper technology. There were also comments made about government policies and regulations which are noteworthy. To get an overall flavor of these responses, the reader is referred to the aggregate responses contained in Appendix C.

III. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

There were several issues which this questionnaire highlighted and which have been addressed in related literature. In discussing Federal agency efforts in technology, O'Brien and Franks note several deficiencies in the Federal technology transfer effort: interagency consistency, cooperation and coordination of efforts, agency commitment of non-mission resources, and formal evaluations to determine the effectiveness of technology transfer activities [Ref. 7: p. 74]. Additionally, they point out that Federal agency attempts to "coordinate their technology and information dissemination activities and to link their limited resources with non-Federal technology transfer networks have been fragmented and not well documented." They point out that the Stevenson-Wydler Act is intended to enhance the coordination and organization of Federal technology transfer activities, to identify more efficiently and more effectively match user needs with Federal R&D information and technology resources and to improve the dissemination of information. They conclude by describing factors upon which they feel the effectiveness of Federal technology transfer and evaluation efforts depend: (1) the referral process, (2) the quality of the match between user needs and Federal resources,

(3) the transfer mechanism employed, (4) the extent of the transfer, (5) the knowledge of the user, and (6) the nature, quality and completeness of the technology transfer information maintained by Federal laboratories [Ref. 7: pp. 75-83].

Samuel Doctors refers to several barriers to the transfer of Federal technology. They include: (1) the mission orientation of many agency technical personnel, (2) the low priority placed on the transfer function by the scientific and technical personnel engaged in Federally sponsored R&D, (3) the political nature of institutions of transfer, (4) the tight security restrictions, (5) the outdated methods of information retrieval and evaluation, (6) the lack of understanding of the transfer process and (7) the power structure of the agencies [Ref. 8: p. 9].

In a report published in 1973, it was stated that there was little exchange of information between Federal activities with regard to technology transfer. In a few agencies, high level support for specific technology transfer activities appeared "lukewarm" [Ref. 9: p. vii].

Many of the responses to the technology transfer agent questionnaire supported these previous findings. One of the main issues of concern by the technology transfer agents who responded to the survey was lack of support for the technology transfer program at their laboratory or agency by laboratory management and by the R&D personnel. Insufficient

funding and personnel support for their offices contributed to this feeling of non-recognition and non-support. Compounding this is the feeling by the technology transfer agents of restrictions placed upon their efforts by the Federal government (specifically OMB and budget limitations) with little guidance from their parent agency on technology transfer (in particular in implementing the Stevensen-Wydler Act where applicable).

In addition to the funding and staffing problems, there are many technology transfer offices that do not have full-time staff. Fifty-eight percent of the technology transfer agents indicated that they were part-time in their position. While laboratories falling under the Stevenson-Wydler Act are required to have a full-time individual staffing the Office of Research and Technology Applications, other laboratories are not required to have this. If laboratory management is truly supportive of its technology transfer program, then it is important that the individual filling the technology transfer agent's position be full-time in order for him or her to become familiar with the job. By occupying the position full-time, the technology transfer agent can develop the personal contacts in the technology transfer field which are prerequisite for an effective technology transfer program. Additionally, a full-time technology transfer agent can provide responsive and reliable service for users who request their assistance.

While Section 11(b) of the Stevenson-Wydler Act does not apply to all Federal laboratories (i.e. creating a full-time staff to man the ORTA), the spirit behind the Act should be noted by all Federal laboratories. In describing the purpose of the Act, it was stated that by having a full-time individual staff the ORTA, an institutional framework would be established for the performance of the technology transfer function at the Federal laboratories. This is critical in order to ensure that technology transfer activities at the laboratories are given the resources and visibility needed to carry out the required functions. At many Federal laboratories, technology transfer is not a recognized, officially sanctioned activity and work performed in this capacity is often not relevant to professional promotion within the organization. Therefore, career development of staff working in technology is sometimes detrimentally affected because time is spent on activities other than those specified in position descriptions upon which promotions are based [Ref. 10: p. 33]. The frustrations of technology transfer agents presently in part-time positions, with limited and insufficient budgets and lack of laboratory recognition for their job were clearly evident in the agents' responses to Question 21.

Forty percent of the technology transfer offices were titled without the word technology (or a derivative) in it. Because some offices are cloaked within or under variously

named offices, it may be difficult for users to contact these offices or for individuals within the laboratory or agency to refer users to the technology transfer agent--because they do not associate the function with the name. While it is not necessary to have the word "technology" in the official title, the title should be descriptive enough for a user to identify its function.

Technology transfer agents perceived that the flow of information between themselves (as well as to the user of technology) needed to be more effective. Part of the problem may be due to security restrictions due to the sensitive nature of the work being performed by some laboratories. However, the major concern appears to be lack of a coordinated effort to pool technology transfer information and to make that available to technology transfer agents as it becomes available in a timely manner. The FLC and its printed materials were viewed as a commonly used source for information by both member and non-member agents of the FLC. Also, the agents indicated that more coordination between user and technology transfer agents was needed in the form of a strong "user-broker" network to identify user's areas of interest and match that with where the technology resource is.

B. RECOMMENDATIONS

Specific recommendations are as follows:

(1) Federal agency guidance for laboratories. This concern arose not only from the questionnaire but also in the

telephone interviews. While the ORTA's were encouraged by the spirit of the Stevenson-Wydler Act, they did not see their parent agencies passing onto them specific guidance in the implementation of those portions of the Act applicable to them. Technology transfer agents not subject to the Act also indicated that they needed more guidance from their parent agency in the technology transfer process.

(2) Increased budget for technology transfer. This is a difficult concern to remedy since budget cuts are being experienced by all Federal programs. However, since the success of a laboratory's technology transfer program partly depends upon the extent that users are contacted or that users contact the laboratory, then it follows that sufficient funding and staff are required to support this effort. What may be needed is a review of existing resources by the laboratories and their technology transfer agents to evaluate the effectiveness and efficiency of the present program.

(3) Increased coordination and cooperation between technology transfer agents and ORTAs. This may provide groundwork for assisting with the limited budget and staffing problems by eliminating duplication of effort. Increased use of existing data storage and retrieval systems as well as networking to keep in contact with technology transfer agents and to gain access to the latest information would assist in matching the user with the appropriate technology. More formal interactions with technology transfer agents are

needed in order to give them the support group where information can be exchanged and solutions generated which address technology transfer problems.

(4) A critical evaluation of the present technology information computer-based systems to identify specific areas for improvement. The present system is used by the technology transfer agents but it is not totally meeting their needs for current and timely information exchange.

(5) Laboratory management's recognition of technology transfer functions. Even if some of the above recommendations are not able to be implemented because of factors beyond the control of the laboratory or agency, the internal structure of the laboratory and agency could give the support and recognition to technology transfer agents and ORTA's that is currently lacking.

(6) To the most practicable extent, make the position of technology transfer agent a full-time position.

(7) Make the title of the office dealing with technology transfer descriptive of its function.

(8) Develop an evaluation or feedback device for users of technology transfer services in order for the technology transfer agents to obtain information about what was effective or ineffective in the transfer process.

(9) Develop a guide or handbook for technology transfer agents. This should contain applicable law and patent information, technology data bases, marketing techniques for

transferring technology, and other pertinent information which can be gathered by individuals currently in the job.

APPENDIX A

PUBLIC LAW 96-480 (STEVENSON-WYDLER ACT)

Public Law 96-480
96th Congress

An Act

To promote United States technological innovation for the achievement of national economic, environmental, and social goals, and for other purposes.

Oct. 21, 1980
[S. 1250]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Stevenson-Wydler Technology Innovation Act of 1980".

Stevenson-Wydler Technology Innovation Act of 1980.
15 USC 3701 note.

SEC. 2. FINDINGS.

15 USC 3701.

The Congress finds and declares that:

(1) Technology and industrial innovation are central to the economic, environmental, and social well-being of citizens of the United States.

(2) Technology and industrial innovation offer an improved standard of living, increased public and private sector productivity, creation of new industries and employment opportunities, improved public services and enhanced competitiveness of United States products in world markets.

(3) Many new discoveries and advances in science occur in universities and Federal laboratories, while the application of this new knowledge to commercial and useful public purposes depends largely upon actions by business and labor. Cooperation among academia, Federal laboratories, labor, and industry, in such forms as technology transfer, personnel exchange, joint research projects, and others, should be renewed, expanded, and strengthened.

(4) Small businesses have performed an important role in advancing industrial and technological innovation.

(5) Industrial and technological innovation in the United States may be lagging when compared to historical patterns and other industrialized nations.

(6) Increased industrial and technological innovation would reduce trade deficits, stabilize the dollar, increase productivity gains, increase employment, and stabilize prices.

(7) Government antitrust, economic, trade, patent, procurement, regulatory, research and development, and tax policies have significant impacts upon industrial innovation and development of technology, but there is insufficient knowledge of their effects in particular sectors of the economy.

(8) No comprehensive national policy exists to enhance technological innovation for commercial and public purposes. There is a need for such a policy, including a strong national policy supporting domestic technology transfer and utilization of the science and technology resources of the Federal Government.

(9) It is in the national interest to promote the adaptation of technological innovations to State and local government uses. Technological innovations can improve services, reduce their costs, and increase productivity in State and local governments.

(10) The Federal laboratories and other performers of federally funded research and development frequently provide scientific

and technological developments of potential use to State and local governments and private industry. These developments should be made accessible to those governments and industry. There is a need to provide means of access and to give adequate personnel and funding support to these means.

(11) The Nation should give fuller recognition to individuals and companies which have made outstanding contributions to the promotion of technology or technological manpower for the improvement of the economic, environmental, or social well-being of the United States.

15 USC 3702.

SEC. 3. PURPOSE.

It is the purpose of this Act to improve the economic, environmental, and social well-being of the United States by—

(1) establishing organizations in the executive branch to study and stimulate technology;

(2) promoting technology development through the establishment of centers for industrial technology;

(3) stimulating improved utilization of federally funded technology developments by State and local governments and the private sector;

(4) providing encouragement for the development of technology through the recognition of individuals and companies which have made outstanding contributions in technology; and

(5) encouraging the exchange of scientific and technical personnel among academia, industry, and Federal laboratories.

15 USC 3703.

SEC. 4. DEFINITIONS.

As used in this Act, unless the context otherwise requires, the term—

(1) "Office" means the Office of Industrial Technology established under section 5 of this Act.

(2) "Secretary" means the Secretary of Commerce.

(3) "Director" means the Director of the Office of Industrial Technology, appointed pursuant to section 5 of this Act.

(4) "Centers" means the Centers for Industrial Technology established under section 6 or section 8 of this Act.

(5) "Nonprofit institution" means an organization owned and operated exclusively for scientific or educational purposes, no part of the net earnings of which inures to the benefit of any private shareholder or individual.

(6) "Board" means the National Industrial Technology Board establisned pursuant to section 10.

(7) "Federal laboratory" means any laboratory, any federally funded research and development center, or any center established under section 6 or section 8 of this Act that is owned and funded by the Federal Government, whether operated by the Government or by a contractor.

(8) "Supporting agency" means either the Department of Commerce or the National Science Foundation, as appropriate.

Office of Industrial Technology, establishment. 15 USC 3704.

SEC. 5. COMMERCE AND TECHNOLOGICAL INNOVATION.

(a) IN GENERAL.—The Secretary shall establish and maintain an Office of Industrial Technology in accordance with the provisions, findings, and purposes of this Act.

(b) DIRECTOR.—The President shall appoint, by and with the advice and consent of the Senate, a Director of the Office, who shall be

compensated at the rate provided for level V of the Executive Schedule in section 5316 of title 5, United States Code.

(c) DUTIES.—The Secretary, through the Director, on a continuing basis, shall—

(1) determine the relationships of technological developments and international technology transfers to the output, employment, productivity, and world trade performance of United States and foreign industrial sectors;

(2) determine the influence of economic, labor and other conditions, industrial structure and management, and government policies on technological developments in particular industrial sectors worldwide;

(3) identify technological needs, problems, and opportunities within and across industrial sectors that, if addressed, could make a significant contribution to the economy of the United States;

(4) assess whether the capital, technical and other resources being allocated to domestic industrial sectors which are likely to generate new technologies are adequate to meet private and social demands for goods and services and to promote productivity and economic growth;

(5) propose and support studies and policy experiments, in cooperation with other Federal agencies, to determine the effectiveness of measures with the potential of advancing United States technological innovation;

(6) provide that cooperative efforts to stimulate industrial innovation be undertaken between the Director and other officials in the Department of Commerce responsible for such areas as trade and economic assistance;

(7) consider government measures with the potential of advancing United States technological innovation and exploiting innovations of foreign origin; and

(8) publish the results of studies and policy experiments.

(d) REPORT.—The Secretary shall prepare and submit to the President and Congress, within 3 years after the date of enactment of this Act, a report on the progress, findings, and conclusions of activities conducted pursuant to sections 5, 6, 8, 11, 12, and 13 of this Act and recommendations for possible modifications thereof. Submittal to President and Congress.

SEC. 6. CENTERS FOR INDUSTRIAL TECHNOLOGY. 15 USC 3705.

(a) ESTABLISHMENT.—The Secretary shall provide assistance for the establishment of Centers for Industrial Technology. Such Centers shall be affiliated with any university, or other nonprofit institution, or group thereof, that applies for and is awarded a grant or enters into a cooperative agreement under this section. The objective of the Centers is to enhance technological innovation through—

(1) the participation of individuals from industry and universities in cooperative technological innovation activities;

(2) the development of the generic research base, important for technological advance and innovative activity, in which individual firms have little incentive to invest, but which may have significant economic or strategic importance, such as manufacturing technology;

(3) the education and training of individuals in the technological innovation process;

(4) the improvement of mechanisms for the dissemination of scientific, engineering, and technical information among universities and industry;

(5) the utilization of the capability and expertise, where appropriate, that exists in Federal laboratories; and

(6) the development of continuing financial support from other mission agencies, from State and local government, and from industry and universities through, among other means, fees, licenses, and royalties.

(b) ACTIVITIES.—The activities of the Centers shall include, but need not be limited to—

(1) research supportive of technological and industrial innovation including cooperative industry-university basic and applied research;

(2) assistance to individuals and small businesses in the generation, evaluation and development of technological ideas supportive of industrial innovation and new business ventures;

(3) technical assistance and advisory services to industry, particularly small businesses; and

(4) curriculum development, training, and instruction in invention, entrepreneurship, and industrial innovation.

Each Center need not undertake all of the activities under this subsection.

(c) REQUIREMENTS.—Prior to establishing a Center, the Secretary shall find that—

(1) consideration has been given to the potential contribution of the activities proposed under the Center to productivity, employment, and economic competitiveness of the United States;

(2) a high likelihood exists of continuing participation, advice, financial support, and other contributions from the private sector;

(3) the host university or other nonprofit institution has a plan for the management and evaluation of the activities proposed within the particular Center, including:

(A) the agreement between the parties as to the allocation of patent rights on a nonexclusive, partially exclusive, or exclusive license basis to and inventions conceived or made under the auspices of the Center; and

(B) the consideration of means to place the Center, to the maximum extent feasible, on a self-sustaining basis;

(4) suitable consideration has been given to the university's or other nonprofit institution's capabilities and geographical location; and

(5) consideration has been given to any effects upon competition of the activities proposed under the Center.

(d) PLANNING GRANTS.—The Secretary is authorized to make available nonrenewable planning grants to universities or nonprofit institutions for the purpose of developing a plan required under subsection (c)(3).

Inventions, title acquisition.

(e) RESEARCH AND DEVELOPMENT UTILIZATION.—(1) To promote technological innovation and commercialization of research and development efforts, each Center has the option of acquiring title to any invention conceived or made under the auspices of the Center that was supported at least in part by Federal funds: *Provided*, That—

(A) the Center reports the invention to the supporting agency together with a list of each country in which the Center elects to file a patent application on the invention;

(B) said option shall be exercised at the time of disclosure of invention or within such time thereafter as may be provided in the grant or cooperative agreement;

(C) the Center intends to promote the commercialization of the invention and file a United States patent application;

(D) royalties be used for compensation of the inventor or for educational or research activities of the Center;

(E) the Center make periodic reports to the supporting agency, and the supporting agency may treat information contained in such reports as privileged and confidential technical, commercial, and financial information and not subject to disclosures under the Freedom of Information Act; and

(F) any Federal department or agency shall have the royalty-free right to practice, or have practiced on its behalf, the invention for governmental purposes.

The supporting agency shall have the right to acquire title to any patent on an invention in any country in which the Center elects not to file a patent application or fails to file within a reasonable time.

Applicant licensing requirement.

(2) Where a Center has retained title to an invention under paragraph (1) of this subsection the supporting agency shall have the right to require the Center or its licensee to grant a nonexclusive, partially exclusive, or exclusive license to a responsible applicant or applicants, upon terms that are reasonable under the circumstances, if the supporting agency determines, after public notice and opportunity for hearing, that such action is necessary—

(A) because the Center or licensee has not taken and is not expected to take timely and effective action to achieve practical application of the invention;

(B) to meet health, safety, environmental, or national security needs which are not reasonably satisfied by the contractor or licensee; or

(C) because the granting of exclusive rights in the invention has tended substantially to lessen competition or to result in undue market concentration in the United States in any line of commerce to which the technology relates.

U.S. Courts of Claims, petition.

(3) Any individual, partnership, corporation, association, institution, or other entity adversely affected by a supporting agency determination made under paragraph (2) of this subsection may, at any time within 60 days after the determination is issued, file a petition to the United States Court of Claims which shall have jurisdiction to determine that matter de novo and to affirm, reverse, or modify as appropriate, the determination of the supporting agency.

Antitrust laws.

(f) ADDITIONAL CONSIDERATION.—The supporting agency may request the Attorney General's opinion whether the proposed joint research activities of a Center would violate any of the antitrust laws. The Attorney General shall advise the supporting agency of his determination and the reasons for it within 120 days after receipt of such request.

15 USC 3706.

SEC. 7. GRANTS AND COOPERATIVE AGREEMENTS.

(a) IN GENERAL.—The Secretary may make grants and enter into cooperative agreements according to the provisions of this section in order to assist any activity consistent with this Act, including activities performed by individuals. The total amount of any such grant or cooperative agreement may not exceed 75 percent of the total cost of the program.

(b) ELIGIBILITY AND PROCEDURE.—Any person or institution may apply to the Secretary for a grant or cooperative agreement available under this section. Application shall be made in such form and manner, and with such content and other submissions, as the Direc-

tor shall prescribe. The Secretary shall act upon each such application within 90 days after the date on which all required information is received.

(c) TERMS AND CONDITIONS.—

(1) Any grant made, or cooperative agreement entered into, under this section shall be subject to the limitations and provisions set forth in paragraph (2) of this subsection, and to such other terms, conditions, and requirements as the Secretary deems necessary or appropriate.

(2) Any person who receives or utilizes any proceeds of any grant made or cooperative agreement entered into under this section shall keep such records as the Secretary shall by regulation prescribe as being necessary and appropriate to facilitate effective audit and evaluation, including records which fully disclose the amount and disposition by such recipient of such proceeds, the total cost of the program or project in connection with which such proceeds were used, and the amount, if any, of such costs which was provided through other sources.

15 USC 3707.

SEC. 8. NATIONAL SCIENCE FOUNDATION CENTERS FOR INDUSTRIAL TECHNOLOGY.

(a) ESTABLISHMENT AND PROVISIONS.—The National Science Foundation shall provide assistance for the establishment of Centers for Industrial Technology. Such Centers shall be affiliated with a university, or other nonprofit institution, or a group thereof. The objective of the Centers is to enhance technological innovation as provided in section 6(a) through the conduct of activities as provided in section 6(b). The provisions of sections 6(e) and 6(f) shall apply to Centers established under this section.

(b) PLANNING GRANTS.—The National Science Foundation is authorized to make available nonrenewable planning grants to universities or nonprofit institutions for the purpose of developing the plan, as described under section 6(c)(3).

(c) TERMS AND CONDITIONS.—Grants, contracts, and cooperative agreements entered into by the National Science Foundation in execution of the powers and duties of the National Science Foundation under this Act shall be governed by the National Science Foundation Act of 1950 and other pertinent Acts.

42 USC 1861 note.

15 USC 3708.

SEC. 9. ADMINISTRATIVE ARRANGEMENTS.

(a) COORDINATION.—The Secretary and the National Science Foundation shall, on a continuing basis, obtain the advice and cooperation of departments and agencies whose missions contribute to or are affected by the programs established under this Act, including the development of an agenda for research and policy experimentation. These departments and agencies shall include but not be limited to the Departments of Defense, Energy, Education, Health and Human Services, Housing and Urban Development, the Environmental Protection Agency, National Aeronautics and Space Administration, Small Business Administration, Council of Economic Advisers, Council on Environmental Quality, and Office of Science and Technology Policy.

(b) COOPERATION.—It is the sense of the Congress that departments and agencies, including the Federal laboratories, whose missions are affected by, or could contribute to, the programs established under this Act, should, within the limits of budgetary authorizations and appropriations, support or participate in activities or projects authorized by this Act.

(c) ADMINISTRATIVE AUTHORIZATION.—

(1) Departments and agencies described in subsection (b) are authorized to participate in, contribute to, and serve as resources for the Centers and for any other activities authorized under this Act.

(2) The Secretary and the National Science Foundation are authorized to receive moneys and to receive other forms of assistance from other departments or agencies to support activities of the Centers and any other activities authorized under this Act.

(d) COOPERATIVE EFFORTS.—The Secretary and the National Science Foundation shall, on a continuing basis, provide each other the opportunity to comment on any proposed program of activity under section 6, 8, or 13 of this Act before funds are committed to such program in order to mount complementary efforts and avoid duplication.

SEC. 10. NATIONAL INDUSTRIAL TECHNOLOGY BOARD. 15 USC 3709.

(a) ESTABLISHMENT.—There shall be established a committee to be known as the National Industrial Technology Board.

(b) DUTIES.—The Board shall take such steps as may be necessary to review annually the activities of the Office and advise the Secretary and the Director with respect to—

(1) the formulation and conduct of activities under section 5 of this title;

(2) the designation and operation of Centers and their programs under section 6 of this Act including assistance in establishing priorities;

(3) the preparation of the report required under section 5(d); and

(4) such other matters as the Secretary or Director refers to the Board, including the establishment of Centers under section 8 of this Act, for review and advice.

The Director shall make available to the Board such information, personnel, and administrative services and assistance as it may reasonably require to carry out its duties. The National Science Foundation shall make available to the Board such information and assistance as it may reasonably require to carry out its duties.

(c) MEMBERSHIP, TERMS, AND POWERS.—

(1) The Board shall consist of 15 voting members who shall be appointed by the Secretary. The Director shall serve as a nonvoting member of the Board. The members of the Board shall be individuals who, by reason of knowledge, experience, or training are especially qualified in one or more of the disciplines and fields dealing with technology, labor, and industrial innovation or who are affected by technological innovation. The majority of the members of the Board shall be individuals from industry and business.

(2) The term of office of a voting member of the Board shall be 3 years, except that of the original appointees, five shall be appointed for a term of 1 year, five shall be appointed for a term of 2 years, and five shall be appointed for a term of 3 years.

(3) Any individual appointed to fill a vacancy occurring before the expiration of the term for which his or her predecessor was appointed shall be appointed only for the remainder of such term. No individual may be appointed as a voting member after serving more than two full terms as such a member.

(4) The Board shall select a voting member to serve as the Chairperson and another voting member to serve as the Vice Chairperson. The Vice Chairperson shall perform the functions of the Chairperson in the absence or incapacity of the Chairperson.

(5) Voting members of the Board may receive compensation at a daily rate for GS-18 of the General Schedule under section 5332 of title 5, United States Code, when actually engaged in the performance of duties for such Board, and may be reimbursed for actual and reasonable expenses incurred in the performance of such duties.

15 USC 3710.

SEC. 11. UTILIZATION OF FEDERAL TECHNOLOGY.

Technology transfer.

(a) POLICY.—It is the continuing responsibility of the Federal Government to ensure the full use of the results of the Nation's Federal investment in research and development. To this end the Federal Government shall strive where appropriate to transfer federally owned or originated technology to State and local governments and to the private sector.

(b) ESTABLISHMENT OF RESEARCH AND TECHNOLOGY APPLICATIONS OFFICES.—Each Federal laboratory shall establish an Office of Research and Technology Applications. Laboratories having existing organizational structures which perform the functions of this section may elect to combine the Office of Research and Technology Applications within the existing organization. The staffing and funding levels for these offices shall be determined between each Federal laboratory and the Federal agency operating or directing the laboratory, except that (1) each laboratory having a total annual budget exceeding $20,000,000 shall provide at least one professional individual full-time as staff for its Office of Research and Technology Applications, and (2) after September 30, 1981, each Federal agency which operates or directs one or more Federal laboratories shall make available not less than 0.5 percent of the agency's research and development budget to support the technology transfer function at the agency and at its laboratories, including support of the Offices of Research and Technology Applications. The agency head may waive the requirements set forth in (1) and/or (2) of this subsection. If the agency head waives either requirement (1) or (2), the agency head shall submit to Congress at the time the President submits the budget to Congress an explanation of the reasons for the waiver and alternate plans for conducting the technology transfer function at the agency.

Waiver.
Submittal to Congress.

(c) FUNCTIONS OF RESEARCH AND TECHNOLOGY APPLICATIONS OFFICES.—It shall be the function of each Office of Research and Technology Applications—

(1) to prepare an application assessment of each research and development project in which that laboratory is engaged which has potential for successful application in State or local government or in private industry;

(2) to provide and disseminate information on federally owned or originated products, processes, and services having potential application to State and local governments and to private industry;

(3) to cooperate with and assist the Center for the Utilization of Federal Technology and other organizations which link the research and development resources of that laboratory and the Federal Government as a whole to potential users in State and local government and private industry; and

(4) to provide technical assistance in response to requests from State and local government officials.

Agencies which have established organizational structures cutside their Federal laboratories which have as their principal purpose the transfer of federally owned or originated technology to State and local government and to the private sector may elect to perform the functions of this subsection in such organizational structures. No Office of Research and Technology Applications or other organizational structures performing the functions of this subsection shall substantially compete with similar services available in the private sector.

(d) CENTER FOR THE UTILIZATION OF FEDERAL TECHNOLOGY.—There is hereby established in the Department of Commerce a Center for the Utilization of Federal Technology. The Center for the Utilization of Federal Technology shall— Establishment.

(1) serve as a central clearinghouse for the collection, dissemination and transfer of information on federally owned or originated technologies having potential application to State and local governments and to private industry;

(2) coordinate the activities of the Offices of Research and Technology Applications of the Federal laboratories;

(3) utilize the expertise and services of the National Science Foundation and the existing Federal Laboratory Consortium for Technology Transfer; particularly in dealing with State and local governments;

(4) receive requests for technical assistance from State and local governments and refer these requests to the appropriate Federal laboratories;

(5) provide funding, at the discretion of the Secretary, for Federal laboratories to provide the assistance specified in subsection (c)(4); and

(6) use appropriate technology transfer mechanisms such as personnel exchanges and computer-based systems.

(e) AGENCY REPORTING.—Each Federal agency which operates or directs one or more Federal laboratories shall prepare biennially a report summarizing the activities performed by that agency and its Federal laboratories pursuant to the provisions of this section. The report shall be transmitted to the Center for the Utilization of Federal Technology by November 1 of each year in which it is due.

SEC. 12. NATIONAL TECHNOLOGY MEDAL. 15 USC 3711.

(a) ESTABLISHMENT.—There is hereby established a National Technology Medal, which shall be of such design and materials and bear such inscriptions as the President, on the basis of recommendations submitted by the Office of Science and Technology Policy, may prescribe.

(b) AWARD.—The President shall periodically award the medal, on the basis of recommendations received from the Secretary or on the basis of such other information and evidence as he deems appropriate, to individuals or companies, which in his judgment are deserving of special recognition by reason of their outstanding contributions to the promotion of technology or technological manpower for the improvement of the economic, environmental, or social well-being of the United States.

(c) PRESENTATION.—The presentation of the award shall be made by the President with such ceremonies as he may deem proper.

15 USC 3712. **SEC. 13. PERSONNEL EXCHANGES.**

The Secretary and the National Science Foundation, jointly, shall establish a program to foster the exchange of scientific and technical personnel among academia, industry, and Federal laboratories. Such program shall include both (1) federally supported exchanges and (2) efforts to stimulate exchanges without Federal funding.

15 USC 3713. **SEC. 14. AUTHORIZATION OF APPROPRIATIONS.**

(a) There is authorized to be appropriated to the Secretary for purposes of carrying out section 6, not to exceed $19,000,000 for the fiscal year ending September 30, 1981, $40,000,000 for the fiscal year ending September 30, 1982, $50,000,000 for the fiscal year ending September 30, 1983, and $60,000,000 for each of the fiscal years ending September 30, 1984, and 1985.

(b) In addition to authorizations of appropriations under subsection (a), there is authorized to be appropriated to the Secretary for purposes of carrying out the provisions of this Act, not to exceed $5,000,000 for the fiscal year ending September 30, 1981, $9,000,000 for the fiscal year ending September 30, 1982, and $14,000,000 for each of the fiscal years ending September 30, 1983, 1984, and 1985.

(c) Such sums as may be appropriated under subsections (a) and (b) shall remain available until expended.

(d) To enable the National Science Foundation to carry out its powers and duties under this Act only such sums may be appropriated as the Congress may authorize by law.

15 USC 3714. **SEC. 15. SPENDING AUTHORITY.**

No payments shall be made or contracts shall be entered into pursuant to this Act except to such extent or in such amounts as are provided in advance in appropriation Acts.

Approved October 21, 1980.

LEGISLATIVE HISTORY:

HOUSE REPORT No. 96-1199 (Comm. on Science and Technology).
SENATE REPORT No. 96-781 (Comm. on Commerce, Science, and Transportation).
CONGRESSIONAL RECORD, Vol. 126 (1980):
May 28, considered and passed Senate.
Sept. 8, considered and passed House, amended.
Sept. 26, Senate concurred in certain House amendments, disagreed to others, and concurred in remainder with amendments.
Oct. 1, House receded from amendments in disagreement and concurred in Senate amendments.
WEEKLY COMPILATION OF PRESIDENTIAL DOCUMENTS, Vol. 16, No. 43:
Oct. 21, Presidential statement.

APPENDIX B

TECHNOLOGY TRANSFER AGENT QUESTIONNAIRE

NAVAL POSTGRADUATE SCHOOL

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17 June 1982

Department of Administrative Sciences

From: Dr. J. W. Creighton, Professor of Management, Department of Administrative Sciences

To: Distribution List

Subj: Research Assistance; request for

Encl: Questionnaire on Technology Transfer

1. The purpose of this letter is to request your assistance in a research project regarding technology transfer agents and their jobs. A Navy officer is assisting me with this study. The objective of our project is to determine the most effective methods to facilitate technology transfer to both the public and private sector.

2. Your laboratory along with a sampling of others are being sent the enclosed questionnaire. Your answers will provide valuable information upon which a data base can be established regarding how laboratory technology is transferred. The survey is confidential and the answers will be combined together and presented as group data. No response from any laboratory will be identified. The success or failure of this research naturally will depend upon your response.

3. The enclosed questionnaire should take approximately fifteen minutes to complete and the time spent in assisting with our project is appreciated. It is requested that the questionnaire be completed and returned in the envelope provided by 26 July 1982. Thank you for your cooperation.

J. W. Creighton
Professor of Management

QUESTIONNAIRE
ON
TECHNOLOGY TRANSFER

1. What is the name of the office at your laboratory through which technical information or assistance is available?

_____

2. What is the organizational title of the individual who heads the office described above?

_____

Because different laboratories may have various names for the answers to the previous questions, they will be referred to in this survey as "Technology Transfer Office" and "Technology Transfer Agent".

3. Is your position as Technology Transfer Agent a full-time or part-time job?

FULL-TIME _____ PART-TIME _____

4. How many assistants does the Technology Transfer Agent have?

FULL-TIME _____ PART-TIME _____

For the purposes of this questionnaire, a USER is any individual/organization within the private sector (business and industry) or public sector (state and local government) that can benefit from applied technologies resulting from federal research and development. The following questions solicit information on users.

5. What is the most common method by which users learn about Technology Transfer activities at your laboratory?

_____ personal contact by technical (R&D) staff
_____ through newspaper articles
_____ through radio or television stories
_____ personal contacts made by a Technology Transfer Staff member
_____ by word of mouth between users
_____ through association contacts or newsletters (i.e., trade associations, Chamber of Commerce, etc.)
_____ attending conferences, workshops, seminars
_____ other. Please explain:

6. To what extent do potential users who request your assistance have a specific request which is adequately defined?

_____ Little extent _____ Some extent _____ Great extent

7. Which methods of Technology Transfer interaction are you most commonly involved with users? (Please rank 3 of the following with "1" being the most common, "2" being the second most, and "3" being the third most common interaction.) (Continued on next page)

_____ the Technology Transfer Office assists the users in developing and presenting a proposal for funding support
_____ the Technology Transfer Office conducts a special study for the user's organization
_____ the Technology Transfer Office aids the user's organization in retrieving information stored in such data banks as EIES, NTIS, DIALOG, etc.
_____ Technology Transfer concepts, equipment, etc. are presented at a conference, seminar or workshop attended by users
_____ giving one-on-one technical assistance
_____ informing users about special laboratory reports on studies which relate to the users organization's needs
_____ having a mailing list to send to users specialized reports, newsletters, etc.
_____ inviting users to participate in the implementation of a packaged program technology, a computer system, etc.
_____ other. Please explain:

The next series of questions will refer to technology transfer projects. For the purposes of this questionnaire, a technology transfer project is any information or assistance provided as a result of interaction between the user and your laboratory.

8. During the life of a technology transfer project, what is the most common method of interacting with the user? (Please indicate only one.)

_____ face-to-face discussions
_____ over the telephone
_____ by mail
_____ computer conferencing
_____ a combination of the above methods
_____ other. Please explain:

9. What percent of your work day is spent interacting with users?_____ % of day

10. Of the time spent interacting with users, please indicate the percent of time you spend daily in the following interactions:

_____% face-to-face discussions
_____% over the telephone
_____% correspondence (mail)
_____% computer conferencing
_____% other. Please explain:

11. Over the past twelve months, please indicate the number of completed projects and lengths of time required for completion by the Technology Transfer Office.

NUMBER OF PROJECTS COMPLETED	LENGTH OF TIME TO COMPLETE
_____	about 2 weeks or less
_____	between 3 and 4 weeks
_____	about 2-3 months
_____	about 4-5 months
_____	about 6 months or more

12. Please indicate the number of projects and the lengths of time your office is currently working on with users.

NUMBER OF PROJECTS	LENGTH OF TIME
_____	less than 1 month
_____	1-3 months
_____	3-6 months
_____	6-12 months
_____	12-24 months
_____	over 24 months

13. When working with a user, please indicate the factor under which you feel most constrained:

_____ time
_____ money for Technology Transfer Office
_____ insufficient number of personnel on Technology Transfer Staff
_____ unclear definition of potential user's problem
_____ other. Please explain:

14. What experience gained prior to your present job has been most helpful in your present job?

15. How long have you been in your present position?

_____ 6 months or less
_____ 6 to 12 months
_____ 12 to 18 months
_____ 18 to 24 months
_____ More than 24 months

16. When you began your present job, were you given any of the following for your job?

_____ specialized training
_____ guidelines or standard operating procedures
_____ a turnover from the previous Technology Transfer Agent
_____ none of the above
_____ other. Please explain:

17. Do you feel that you needed or would have benefited from such training?

YES _____ NO _____

18. Do you feel that there is an adequate communication network between Technology Transfer Agents in order to keep up to date with current information?

YES _____ NO _____

19. Please indicate the methods most used by you to keep informed in the Technology Transfer field of latest developments:

_____ conferences/workshops
_____ Federal Laboratory Consortium bulletins/newsletters
_____ open literature
_____ discussions with other technology transfer agents
_____ other. Please explain:

20. What percentage of your projects are transferable to state or local governments or private industry?

_____ less than 30%
_____ 30% to 60%
_____ over 60%

21. Please list three factors/items which would assist you in making your job as a Technology Transfer Agent more effective.

APPENDIX C

QUESTION 21 RESPONSES

Question 21:*

Please list the three factors/items which would assist you in making your job as a Technology Transfer Agent more effective.

Response:

31	more support and recognition from management; internal support from scientists and researchers; sponsoring Federal agency recognition; support, guidance from sponsoring Federal Agency on funding available for Technology Transfer activities (travel, conferences, publications, free consulting); greater agency backing and support for Technology Transfer activities; institutionalize Technology Transfer activities into Agency operations; less other duties
25	additional funding (also related: guaranteed budget, line item budget)
22	more interaction between Technology Transfer Agents or users (conferences, forum similar to NASA Tech Briefs; national computerized data base on technologies and expertise; better communication and networking; computer system for storage and retrieval; more information "switchboard" activity by NSF/FLC Program Manager; computerized matching system to permit labs and user agencies to identify areas of interest and assistance; stronger user-broker network)
13	more staff
10	concern with government (better guidance on goals and policies of ORTA from primary sponsors and administration; policy from OMB favorable to Technology Transfer; Technology Transfer concerns

*Numbers indicate number of respondents listing a particular response.

factored into front-end of R&D program design; exception to federal publishing regulations allowing more flexibility in design of documents and audio-visuals for non technical end users; resolution of conflict between Military Critical Technology and Stevenson-Wydler Act; understanding of USN's position on Technology Transfer; better guidance from DOD on treatment of sensitive areas; a domestic critical technologies list; list of U.S. corporations having foreign ownership or interest)

8 more time (make position full-time)

8 other (training; less bureaucracy from users; more space and equipment; less concern by administration over who should be conducting research--government or industry; volunteer program at lab to provide services to state and local governments requesting them)

6 travel

5 defining problems to be solved; periodic review of R&D needs in private sector, local, and state governments to see what help the federal labs can provide; better entry into private industry

4 public affairs and public relations (10 minute film illustrating labs' capabilities that would be of commercial interest; more information on developing market and cost information for products; media announcements describing availability of Federal lab technology)

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